

مجلس الخدمة المدنية
اللجنة الفاحصة
دائرة المباريات

مباراة مفتوحة لقبول طلاب في شهادة الكفاءة
في كلية التربية في الجامعة اللبنانية للتعين بوظيفة
استاذ تعليم ثانوي/ اختصاص العلوم الطبيعية في
ملاك وزارة التربية والتعليم العالي.

الوقت : ساعتان

مسابقة في الثقافة العامة باللغة العربية.

نتج عن التقدّم العلميّ في عصرنا الحاليّ مشكلات بيئية واجتماعية .
اشرح هذا الرأي ، مبيناً دور العلم في معالجة هذه المشكلات ومسؤولية المواطن في الحدّ منها .

بيروت، في ١٢/٤/٢٠٠٨

اللجنة الفاحصة

مجلس الخدمة المدنية
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مباراة ٢٠٠٨/٤/٥ لقبول طلاب في شهادة الكفاءة في كلية التربية
في الجامعة اللبنانية للتعين بوظيفة أستاذ تعليم ثانوي

الوقت: أربع ساعات

الاختصاص: علوم طبيعية باللغة الإنكليزية.

مسابقة في الاختصاص المطلوب / عدد صفحات المسابقة (٦).

ملاحظة : يرجى وضع الإجابة بالتسلسل وفقا لتدرج أرقام الأسئلة و بالقدر المحدد لها .

Genetics and Biotechnology

- 1 - Is the transcription initiation site the same as the translation initiation site? Explain (maximum of 3 lines).
- 2 - A gene can encode two different versions of the same protein by a mechanism known as:
- 3 - A particular tRNA carries a specific amino acid. What is the actor responsible for this specific charging?
- 4 - Does a cDNA contain introns ? Justify your answer (maximum of 3 lines).
- 5 - What are the roles of the 5'-cap and the 3' poly-A tail ? (maximum of 3 lines).
- 6 - If thymine constitutes 15% of bases of a given DNA, what will be the percentage of cytosine?
- 7 - What are the two possible molecular tools used to screen a DNA library (cDNA and/or genomic).?
- 8 - What is the cause of the formation of a 47,XYX karyotype? (maximum of 3 lines).
- 9 - What would be the consequences (in terms of genetic information) of a non-corrected error during:
 - a - replication of an exon of a given gene ? (maximum of 3 lines).
 - b - transcription of the same gene ? (maximum of 3 lines).
- 10 - How many possible reading frames are there in the 5'-3' direction of a mRNA? Define the "open reading frame" (maximum of 3 lines).
- 11 - Does translation directly produce a functional protein? Justify your answer. (maximum of 3 lines).

12 – What are the phenotypes of individuals and their percentages resulting from a genetic cross between AaBbCc x aabbcc where “A” and “B” are absolutely linked. (justification not required).

13 – Give two chromosomal abnormalities that lead to Down syndrome.

14 – Briefly explain how do you diagnose a suspected HIV patient before the seropositivity stage (early infection stage)? (maximum of 4 lines).

15 – Genes « a » and « b » are linked with 10% recombination. What will be the phenotypes and the percentages of the progeny of the following cross? (Justification not required).

ab+/a+b x ab/ab

16 – If a normal diploid cell is 2n, what is the chromosome number in the following cells?

a – a monosomic cell b – a tetrasomic cell

c – a double trisomic cell d – a tetraploid cell

17 – If you were a genetic counselor, what do you advise a 10-week pregnant mother who is 38 years old? Justify your advice. (maximum of 3 lines).

18 – What are the nature and the properties of the probe used in DNA fingerprinting? (maximum of 3 lines).

19 – Give three causes responsible for DNA polymorphism.

20 – In addition to DNA polymerases, name two other enzymes that are involved in replication.

Reproduction

21 - At which stage of meiosis does crossing-over take place?

22- Are there one or more DNA replications during the cell cycle? Indicate the stage of cell cycle where it occurs.

23 – Which of the following germ line cells have chromosomes formed of one chromatid? Spermatogonia, spermatocyte II, spermatid, oocyte I and second polar body.

24 – Give the histological location and the function of Leydig cells and Sertoli cells.

25 – What is the role of mitochondria in the intermediate piece of sperm cell?

26 – Give the origin of the acrosome. Name the enzymes secreted by it.

27 – At the time of ovulation, what is the precise meiotic stage of the released female gamete?

28 – What are the cellular structures of the ovarian follicle that form the corpus luteum?

29 – What is the origin of the cervical mucus? Give its function during the period when fertilization does not occur.

30 – At which stage of its development, does the embryo implant in the epithelium of the uterus?

31 – How many days separate fertilization from implantation of the embryo?

32 – Name the main hormones that are secreted by the placenta.

Botany

33 – During photosynthesis, what are the products of the light dependent reactions? Where in the chloroplast do these reactions take place?

34 – Name the enzymes that fix CO₂ in C₃ and C₄ plants.

35 – Give the origin of dioxygen liberated during photosynthesis.

36 – Name in the order of formation the different steps of lignified vessels in plants.

37 – Name the conduction vessels of crude sap and those of elaborated sap. Which one of these two types of vessels is made up of living cells?

Immunology

38 – When vaccinated, a person produces an antibody response. For this response to be effective T cell-B cell interaction must take place. In other words, the vaccine should be a Th-dependent antigen.

- a) How does the B cell function as an antigen presenting cell? (3 lines)
- b) How does the Th cell recognize the processed antigen? (2 lines)
- c) Is this interaction sufficient to complete the co-operation between T and B cells? Explain. (3 lines)
- d) What are the effects of cytokines produced by the Th cell on the B cells (precise the type of cytokines if the T helper cell is a Th1 type? (3 lines)

39 – In an adult human, T cells can recognize self proteins from non-self proteins. As a result, the T cells are said to be self tolerant. T cells acquire this tolerance when they undergo maturation and selection in the thymus.

- a) Name the main stages of T cell development in the thymus. (2 lines)
- b) Precise the site in the thymic lobule where these stages take place. (1 line)
- c) Describe the mechanism associated with the selection process of T cells in the thymus. (6 lines)
- d) Deduce the consequences of this selection process. (2 lines)

40 – Some people are allergic to bee venom, and develop a hypersensitivity reaction, while others are not. A person stung by a bee developed the following symptoms minutes after the sting: difficulty breathing, generalized edema, and a drop in blood pressure. He was rushed to the hospital for treatment.

- a) Name the allergic reaction observed in this case. Justify your answer. (2 lines)
- b) Define a hypersensitivity reaction. (2 lines)
- c) Which class of antibodies is responsible for mediating this reaction? Indicate the effect of Th cells on the production of this antibody. (2 lines)
- d) The observed symptoms are caused by the release of certain potent pharmacologic substances. Name these substances, and indicate their source of origin (4 lines)

Neurophysiology

41 – Why the resting potential is not equal to the equilibrium potential of K^+ ?

42 – Why membranes are more permeable to non polar molecules than polar and ionized molecules? How should the current pass between the interior and exterior of the cell membrane?

43 – By which mechanism an increased concentration of intra cellular Na^+ may increase exocytosis?

44 – What is the ionic mechanism that interrupts the depolarization of a neuron ?

45 – A neuron in the medulla receives information from different regions of the brain. Is this an example of convergence or divergence?

46 – If the binding of a neurotransmitter to a receptor leads to the closure of the K^+ channels, would you consider this an EPSP or IPSP?

47 – What is the consequence of inhibiting a presynaptic inhibitory neuron?

48 – Why chemical synapses transmit information in one direction?

49 – Explain why the effects of the first messenger do not stop immediately after its elimination.

50 – An isolated muscle and its motor nerve are placed in a calcium free physiological medium. Is the muscle going to contract?

- If its nerve is stimulated?
- If the muscle is directly stimulated?
- Justify your response.

51 – Muscle is an effector organ. Could it also be called a receptor organ? Justify.

52 - Why the neck extensor muscle of the head is considered an antigravity muscle?

Regulation and Metabolism

53 - What is the advantage of achieving regulation of blood glucose by two hormones that have opposite effects instead of using a single hormone that changes the glucose level in one direction?

54 - What are the major targets (organs/tissues) for the anabolic effects of insulin?

55 - How you might explain the difference between insulin dependent diabetes mellitus (IDDM) and non insulin dependent diabetes mellitus (NIDDM)? Which of the two types is easier to correct? Justify your response.

56 - Using a flow chart, diagram the endocrine regulatory interrelationships between the hypothalamus, anterior pituitary and ovaries.

57 - If the gonads are removed from immature females and transplanted into mature females, the transplanted gonads begin functioning. However, if gonads from mature cycling females are transplanted into immature females no cyclicity occurs. What conclusion can you draw from these results regarding the maturity at the different levels of the hypothalamo-hypophyseal-ovarian axis?

58 - Women treated for a long period of time with estrogens do not ovulate. Explain specifically why?

59 - If the anterior pituitary was removed from its place and transplanted into another vascularized region in the neck. Would the secretion of gonadotropic hormones be affected? Justify your answer.

60 - Cycling females were injected by radioactively labeled estrogens and radioactively labeled LH hormones. Where in the cells, that are responsive to these hormones, you will be able to localize these hormones?

61 - Mature females who are deficient in cholesterol will not be able to cycle. Why?

62 - Which of the ATP recovery pathways is used during intensive short term exercise, and during long term duration exercise? Justify.

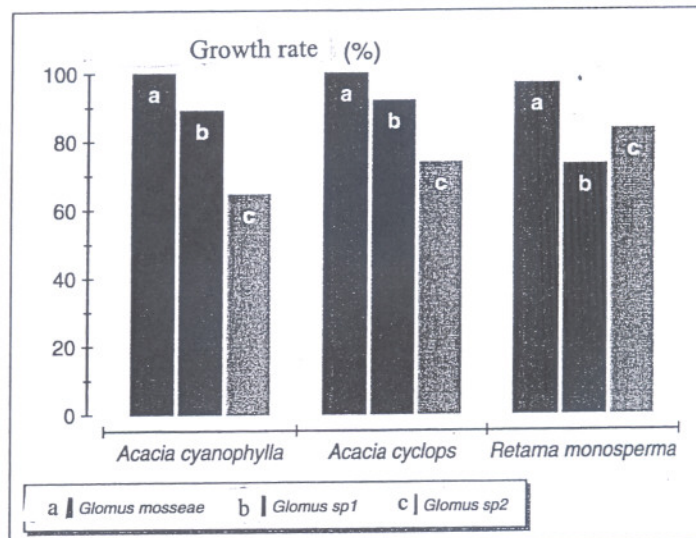
63 - Why phosphocreatine is a rapid pathway for ATP recovery?

64 - How does the VO_2 max change with age and training?

65 - What is the role of NAD^+ during the process of cellular respiration?

Ecology

- 66 - Enumerate three global environmental problems.
- 67 - Name three local environmental problems (different of those given in the first question).
- 68 - There are 6 types of forests in Lebanon. List 3 of them and indicate at which approximate altitude they live.
- 69 - How do you explain the constant carbon dioxide rate in the atmosphere until around 15 years ago?
- 70 - List the human activities that can disrupt the equilibrium of the carbon cycle?
- 71 - State the major consequences of the amplification of the green house effect.
- 72 - Indicate the different trophic levels of a food web, the last of which being an eagle.
- 73 - By which processes the fuel layers, dumped in the marine ecosystem, cause the death of living organisms (animals and plants)?
- 74 - Read the following graph which shows the percentage of growth of 3 plants of the family Leguminosae (*Acacia cyanophylla*, *Acacia cyclops* and *Retama monosperma*) after inoculation of 3 Mycorrhizes (*Glomus mosseae*, *Glomus sp1* et *Glomus Sp2*) which are fungi, that favor the absorption of phosphates and water by these plants. Which conclusions can you draw from this graph?



بيروت في ٢٠٠٨/٤/١٢

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